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REPORT
OF
THE COMMISSIONERS
APPOINTED BY
JOINT RESOLUTIONS
OF THE
HONOURABLE THE SENATE AND ASSEMBLY
OF THE
STATE OF NEW-YORK,
OF THE 13TH AND 15TH OF MARCH, 1810,
TO EXPLORE
The Route of an Inland Navigation,
FROM
HUDSON'S RIVER
TO
LAKE ONTARIO AND LAKE ERIE.

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1811.

REPORT, &c.

THE Commissioners appointed by joint resolutions of the honourable the Senate and Assembly of the State of New-York, of the 13th and 15th March, 1810, to explore the route of an Inland Navigation from Hudson's river to Lake Ontario and Lake Erie, beg leave to

REPORT :

THAT they have examined the country as critically as time and circumstances would permit, and caused surveys to be made for their better information. They beg leave to observe on the present navigation by the Mohawk river, Wood Creek, Oneida Lake, and the Oswego river, which extends from Schenectady to Lake Ontario, saving only a portage at the falls within twelve miles of Oswego, that experience has long since exploded in Europe, the idea of using the beds of rivers for internal navigation, where canals are practicable. The reasoning on that subject applies with greater force in America ; for in the navigation of rivers, reliance must be had prin-

cipally on the labour of men, whereas along canals, the force employed is generally that of horses ; but the labour of men is dearer, and the subsistence of horses cheaper in America than in Europe. Experience, moreover, has, in this country, declared against following the course of rivers, more decidedly than in the old world ; for there, notwithstanding the excellence of the highways, transportation is performed, between Rouen and Paris, for instance, in boats drawn up the river ; but along the Mohawk, though the road from Schenectady to Utica is far from being good, it is frequently preferred to the river. By the aid of canals, a good navigation, for boats, can unquestionably be made, from Schenectady to the falls in the Oswego river, twelve miles south of Lake Ontario. From Schenectady to the Hudson, and from the falls just mentioned to the Lake Ontario, a boat navigation is also practicable ; but whether it be adviseable, may deserve consideration.

A preliminary point to decide, is, whether by this route, vessels can be taken across of size and form to navigate with advantage Lake Ontario and Hudson's river ; such, for instance, as sloops and schooners of fifty or sixty tons. The Commissioners believe this to be impracticable, from the want of water at the summit level ; whether a sufficient supply, even for boats, can be obtained in a dry season, should the whole trade of the great Lakes be turned that way, is a matter wor-

thy of consideration. Admitting, however, that the boat navigation were completed to the falls in Oswego river, and a sufficient supply of water secured, it remains to inquire, whether it would be prudent to expend what may be needful on the navigation between those falls and the Lake. It will be seen by the report of the Surveyor, hereto annexed, that in this distance there is a descent of little less than one hundred feet, and that the circumstances are peculiarly unfavourable ; so much so, that an intelligent practical man (Mr. Weston) formerly pronounced it impossible. That word, however, when used on occasions of this sort, must be understood as standing in relation to the means which can prudently be applied to the end. In examining the amount of expenditure which prudence may justify, it is to be noted, that if the same boat which arrives at the upper end of the Falls, could, after reaching Oswego, proceed on her voyage, it might be worth while to calculate, whether the saving of time and expense in lading and unlading, would bear any rational proportion to the cost of completing that navigation ; but that is not the case, and therefore it would be more adviseable, if the communication be deemed of sufficient importance, to construct a rail-way. This, according to the estimate of an intelligent and experienced man (Mr. Latrobe) annexed to Mr. Secretary Gallatin's report on canals and roads, would cost about ten thousand dollars per mile ; and by the aid of it,

one horse could transport eight tons, supposing the angle of ascent not to exceed one degree. But an angle of one degree will ascend in a mile upwards of ninety-two feet, or nearly as much as the difference of level in the whole twelve miles; if then, two dollars be allowed for a horse, waggon, and driver's wages, with such return load as he can procure for his profit, and ten cents be allowed for the use of the rail-way, and if it be supposed that only five tons be taken instead of eight, the cost will be for each ton the twelve miles, forty-two cents, or three and a half cents per mile; at which rate, one hundred and forty miles, a greater distance than between Oswego and Lewistown, along Lake Ontario, would come to four dollars and ninety cents, being thirty-five cents less than the freight now paid.

A question, however, of more importance presents itself. Admitting that it were easy to complete a boat navigation from Rome to Lake Ontario, and more difficult and expensive, in comparison, to effect a canal navigation to Lake Erie, would it not be adviseable to descend into Lake Ontario, rather than encounter the difficulty and expense of the other course? The Commissioners believe it would not, and without relying, as they might, for support of their opinion, on the comparative expense of transportation, a topic which will find a better place elsewhere, it is sufficient to say here, that articles for exportation, when once afloat on Lake Ontario, will,

generally speaking, go to Montreal, unless our British neighbours are blind to their own interest, a charge which ought not lightly to be made against a commercial nation. Freight from Niagara to Oswego, will, from the difficult and dangerous access to that harbour, be as high as to the head of the rapids in the river St. Lawrence. The descent from thence to Montreal is less than the ascent from Oswego to Rome. It is true that the Lake Ontario is estimated at one hundred and ninety-six feet above tide water, and the Rome level only one hundred and eighty-four feet above the Lake, but there is a considerable descent in the river St. Lawrence, in a distance of about seventy miles to the lower end of the present sloop navigation, through which the current is sometimes strong. There is also a considerable descent from Montreal, in a distance of about thirty miles to tide water, in the Lake St. Peters. Perhaps it will be found that an average allowance of three inches per mile, in the whole upwards of twenty feet, is not too much, and that the river at Montreal is not one hundred and seventy feet below the upper surface of the Gallots' Rapids. In the distance of one hundred miles between these places, there are forty of still water, viz. about thirty in Lake St. Francis, between the foot of Long Saut and the head of the Coteau du Lac rapid, and upwards of ten in the Lake of the Two Mountains, between the foot of the cascade at the cedars, and the La Chine rapid. Thus there

will remain but sixty miles of canal, with an average fall of thirty four inches per mile. The land descends proportionately to the water, so that there can be but little deep cutting; the soil is easy to dig; there are no streams or ravines of any consequence to cross; and there is an inexhaustible supply of pure water, which never varies much in its height, for any canal whatever.

Under circumstances so propitious, it is probable that a good sloop navigation from above the Gallops to Montreal, would cost less than a good boat navigation from Oswego to Rome. The extent of this last, deducting the Oneida Lake, is fifty-six miles; the Fall is on an average near forty inches per mile; the supply of water is doubtful; and in twelve miles of the distance, obstacles almost insurmountable present themselves.

These are facts, to which it would be in vain for the citizens of the United States to shut their eyes. The eyes of a rich, enterprising, commercial rival are open: and when it is considered that, if the means of easy export be supplied to the inhabitants who may settle near the great lakes, that country will, in no distant period, furnish a more abundant stock of commodities for foreign trade, than is now sent from all the Atlantic ports of the union, it would be absurd to doubt, whether in the competition for that commerce, our neighbours will employ the means in their power. Nor must it be forgotten, that the revenue, which, under present circumstances is

raised from commerce, and which no probable change will reduce below an advalorem duty of ten per cent. cannot but operate in favor of our rivals. True it is, that as far as regards the pecuniary benefit of those who may settle along the Lakes, the route by which their products are sent abroad, and their supplies of foreign articles introduced, must be to them a matter of little consequence. But the political connexion, which would probably result from a commercial connexion, certainly deserves the consideration of intelligent men.

The Commissioners have no doubt that the obstructions at the head of Oneida Lake may be removed, so as to lower the surface of that Lake, from eighteen inches to two feet, at no great expense, and with little, if any injury to the navigation; but they have not been able to satisfy themselves, that the lands contemplated in the petitions, which the joint resolutions refer to, would be in any wise affected by operations at the mouth of Oneida Lake. According to the information they have obtained, these lands are inundated by the waters of Butternut, Limestone, Chitinengo, and Canaseraga creeks, obstructed before their entrance into the Lake.

In respect to an Inland Navigation direct from Lake Erie to Hudson's river, the Commissioners beg leave to refer for information, to the annexed reports and maps of Mr. James Geddes, employed at their request by the Surveyor General. From

these it is evident, that such navigation is practicable. Whether the route he sketched out will hereafter be pursued, whether a better may not be found, and other questions subordinate to these, can only be resolved at a future time, when an intelligent man, regularly bred to this business, shall, under the direction of those on whom the public may think proper to devolve the superintendence, have made a more extensive and careful scrutiny, than the time and means of the Commissioners would permit. They conceive, however, that it may not be improper to say a few words on the topography of the country, which may be divided into three parts; nearly equal.

The Mohawk river, as is well known, runs in a deep ravine, and there is, generally speaking, along its banks, a vale of rich soil. In different places, however, spurs from the neighbouring hills project themselves to the edge of the river. On the north side fall in, sundry small streams, and two, the east and west Canada creeks, which are large and copious, especially the latter. They are both rapid, and run in deep ravines. On the right side, also, there are several tributary streams. The most considerable of these is the Schoharie, which, rising among the Catskill Mountains, has scooped out with its impetuous waters, a wide and deep ravine.

The stream next in importance, coming in from the south, is the Oriskany, which is essentially

valuable, because it enters the river not far from the summit level at Rome, and may perhaps become useful as a feeder. This forms the first eastern, or river division, in which, navigation, though defective, already exists.

In this division, with proper management, there will be no defect of water for a boat canal, unless, perhaps, in very dry seasons, at the summit level.

The second, middle, or Lake division, extends from the summit level, westward, to the outlet of the Canadarque Lake. In it lie four Lakes; the Otisco, Skeneateles, Owasco, and Canadarque, higher than any canal which may be extended from Lake Erie to the Hudson, and furnishing a copious supply of water. Of the two largest Lakes, the Seneca, increased by a stream from Crooked Lake, lies nearly on the same level with Rome, but the Cayuga much lower.

In this division, the turnpike road crosses high hills, but they all terminate not far north of it, leaving a large deep valley, upwards of eighty miles long, from east to west, and about twenty wide, from northwest to southeast. If, indeed, the Cayuga Lake, embosomed in a ravine which opens to the north on the valley, be considered as part of it, the breadth will be fifty miles. In this valley lie the Onandaga, Cross, and Oneida Lakes. It is bounded on the north by a dividing ridge of land, which stretches from near the Gerundegut bay eastwardly, to the neighbourhood of Rome, where it joins the dividing ridge, north of the

Mohawk, between the waters of the St. Lawrence, and those of the Hudson.

The third, western, or dry division, extends from the western boundary of the lake division to Lake Erie. In this, although the Genesee river runs through it, a want of water is already felt, and will daily become more sensible, as the country is cleared. The Genesee river itself is a torrent, which, however copious, or even superabundant it may be in the spring, is, in the autumn, almost dry. This tract of country, especially after passing the flats of the Genesee, may, with little violence to the propriety of language, be called a plain. And here it may be proper to notice, a peculiarity in the shape of the northern, and much of the western part of the state, which distinguishes it widely from the country lying southeast of the mountains. The descent from the dividing ridge, northward, is generally by a gradation of plains,* nearly horizontal. These, and the streams by which they are watered, have a similar, and, as it were, a simultaneous descent. Thus the rivers are but a kind of lakes, lying in plains, and communicating by falls and rapids, with each other. These gradations have sometimes a small rise, immedi-

* *Note.* The word plains might lead into error. It is therefore proper to state, that hills are scattered about, which vary the surface to the eye, but on examination it will be found, that, generally speaking, their bases are all on the same extended plain.

ately before the descent ; at other times, in ascending from one, we come immediately to the other. In no case is the peculiarity of shape more worthy of remark, than at the Cataract of Niagara. In coming from Lake Erie, where the sight cannot reach over the expanded surface, proceeding along the level bank of the Niagara river, to the head of the rapids immediately above the falls, and thence pursuing a northern course, the traveller ascends but thirty-eight feet, before he descends three hundred and forty-five, to the plain in which Lake Ontario is stretched out, from east to west, upwards of one hundred and sixty miles. The surface of Lake Erie is three hundred and twenty-nine feet above that of Lake Ontario, which being taken from the whole descent, just mentioned, leaves for the rise of land between those two great reservoirs, but sixteen feet. This rise, and others similar to it, are called by the inhabitants, the ridge, the ledge, the slope, and the hill. A more proper general appellation, perhaps, is the steep, though occasionally, by the elevation each way, it becomes truly a ridge, or from the horizontal strata of stone, as truly a ledge. In some places the descent is by a gentle slope, in others more precipitous, and in some, almost perpendicular. Two of these extend eastward, from the shore of Niagara river, nearly parallel to and distant from each other, about fourteen miles. The higher or southern steep commences at Black Rock, where the river issues

from Lake Erie. The northern commences at the Falls, and after an eastern course of fifty or sixty miles, bends towards and approaches the southern, after which they both take a southern direction for thirty miles, but return again on the east side of the Genesee ; or to speak more correctly, that river, after breaking through them by successive falls of sixty and ninety feet, thirty miles south of the high road in the township of Avon,* runs in a ravine to the northern part of that township; when the steeps again diverge, the southern stretching eastwardly to the west side of the Seneca Lake, and then southerly to the high grounds, from whence flow the waters of the Tioga ; while the other keeps an eastern direction to the hills, from whose southern declivities flow the Chenango and Unadilla. There is another steep still more north, which branches out from that last mentioned, near the eighteen mile run (a stream whose mouth is at that distance from that of the Niagara river) and diverging northward, is for some distance in its eastern progress, indistinct; it extends, however, to the lower falls of the Genesee, and is there crossed by that river, as also beyond it by streams which fall into the Gerundegut Bay, after which it becomes properly a ridge, and extends beyond the falls of Oswego River, as has been already mentioned.

* Formerly Hartford.

Of these three steeps, ledges, or ridges the most southern is distinguished by limestone mixed with flint, the middle by the same stone mixed with shells, and the most northern by freestone and slate. Over the southern steep, west of the Genesee River, falls Ellicot's brook and the Tonewanta, which enter Niagara River by the same mouth, opposite to Grand Island, also Allen's brook, which makes at its passage the Buttermilk falls, and runs to the Genesee. Over the middle steep, in the same division, falls the Oak-Orchard brook, which enters Lake Ontario about thirty miles east of Niagara river. The lower falls of this brook, as well as those of the Genesee, are over the northern steep.

The Canesus, the Hemlock, the Honeyoyo, the Canadarque, and the Crooked Lakes, lie south of the southern steep. The Seneca, the Owasco, the Skeneateles and Otisco Lakes, lie south of the Middle Steep; north of which lie the Cayuga, Onondaga, Oneida and Cross Lakes.

The Tonewanta falls over the southern steep twenty-five feet, and passing the village of the same name, runs in a level valley, of brown clay, upwards of twenty miles, to its mouth in Niagara river. From the Tonewanta Village, northeastward, in less than five miles, chiefly through a swamp, the Oak Orchard brook receives the waters of the swamp, and falls, as has been already mentioned, into Lake Ontario. The Tonewanta brook, three feet higher than the swamp, is sepa-

rated from it by ground whose elevation is not more than five feet, the distance is short of a mile, and the soil being clay, it will be easy, by turning its waters into Oak Orchard brook) to convert the Tonewanta from its mouth upwards into a canal. It has above eleven miles from its mouth a depth of twelve feet, interrupted, nevertheless, by five bars or shallows, composed of round stones buried in clay. During this space, the breadth is generally forty yards, though in the narrowest not more than thirty. The first shallow, about three miles from the mouth, is called Miller's ford, and is not above twelve yards wide; the next, about a mile beyond it, called House's shallow, extends east and west nearly one hundred and twenty yards, the depth of water from two and a half to three feet. Two miles further up is Christman's rapid, this extends east and west near two hundred and fifty yards, with a depth of from fifteen to eighteen inches. At this rapid the fall is three inches, except when a westerly wind brings up the water of Lake Erie. The breadth of the Tonewanta is here forty-eight yards, and no where below it less than forty.—The next bar, about a mile from the last, is called Van Slyke's shallow, it extends forty-two yards, the depth in the shoalest place, twenty inches, but in general from two to three feet.—The fifth and last bar, at eleven miles from the mouth of the creek, extends near one hundred and eighty yards, and has from one to two and a half feet of water.

To convert this water course into a canal twelve feet deep, during the whole distance of eleven miles, will require, at most, an excavation of eighty thousand cubic yards. The surface here is four inches higher than at the mouth, which is five feet lower than the surface of Lake Erie.—

At about five miles and a quarter north from this place, in the middle steep, is the source of one branch of the eighteen mile brook, at a distance of about ten miles from Lake Ontario, and about three hundred feet above its surface; consequently near thirty feet below the surface of Lake Erie. The greatest elevation of ground is twenty-one feet above that surface; it is, however, on an average, for the space of three miles, twenty feet, and the remaining two miles and a quarter, about seven feet. For a more particular knowledge of the ground, reference must be had to the profile made by Mr. Geddes, and which is hereto annexed. It is self-evident, that the cost of excavation per cubic yard, must depend on the substance in which the excavation is made; it must depend also on some other circumstances. In deep cutting for instance, not only must there be wide cutting, to prevent the earth from falling in, but there will, generally speaking, be more labor, and consequently more expence in moving the earth after it is dug. It may become, therefore, in many cases, more adviseable to pierce the earth by a tunnel, than to take down the top of a hill. In the present instance, by means of wooden

rail ways, which may be constructed from the surrounding forests for a temporary purpose at trifling expense, the materials, when dug, may be made as it were to transport themselves along gentle declivities, to fill that part of the ravine through which the canal is to pass.

In the construction of canals, when recourse is had, as must generally be the case, to rivers for a supply of water, it is found necessary to guard with scrupulous care, and not unfrequently at enormous expense, against those floods, which pouring a torrent into a canal and tearing down its banks, might at once destroy the navigation and inundate the country. Moreover, it is found that canals, depending on rivers, frequently like the rivers themselves, want water in the season when it is most necessary. Indeed to suppose the quantity of water in a river, when turned into a canal will remain the same, would lead to serious disappointment; much must be allowed for evaporation, and notwithstanding the utmost care, more will filter through the sides and bottom of a canal than those of a river, which are generally saturated.

Thus then two prominent evils present themselves in feeding from rivers, viz. in spring they pour in too much water, and can afford none in autumn when it is most wanted. There is still another evil, which though not so imminent, becomes eventually of serious moment. When the country shall be cultivated, streams swollen by

showers, will bring down mixed with their waters, a proportion of mud, and that, in the stillness of a level canal, will subside and choak it up. It is also to be noted, by those who shall construct canals in this country, that the true character of a river cannot now be known. Large tracts, for instance west of the Genesee, which appear as swamps, and through which causeways of logs are laid for roads, will become dry fields, when no longer shaded, as at present, by forests impervious to the sun. In the progress of industry, swamps, the present reservoirs of permanent springs, that burst out on a lower surface, will be drained, whereby many of those springs will be dried. Of such as remain, a part will be used to irrigate inclined plains. Moreover, in every place tolerably convenient, ponds will be collected for mills and other machinery, from whose surface, as well as from that of the soil, the sun will exhale an ample tribute of vapour.

Thus the summer supply of rivers will be in part destroyed, and in part consumed, whereby their present autumnal penury must be impoverished ; but in the spring, the careful husbandman and miller will open every ditch and sluice, to get rid of that water, which, though at other times a kind friend and faithful servant, is then a dangerous enemy and imperious master. Of course, much of what is now withheld for many days, will then be suddenly poured out. The torrents must, therefore, rage with greater fury hereafter, than they do in the present day.

Considerations like these, while they cast a shade over many contemplated enterprizes, give, by contrast, a glowing hue to that which we have now to consider. The canal from Lake Erie to the Hudson, may be fed by pure water from lakes, provided mounds and aqueducts be made over intervening vallies, or the canal be carried round them. In every case, the attending circumstances must decide. In general, also, it is only after a more accurate examination of the ground, by a skilful engineer, well practised in such business, that the best mode can be adopted, for the species of navigation which may be ultimately determined on, viz. whether for vessels which navigate Hudson's river and Lake Erie, or for barges of from twenty to sixty tons. If the passage were only of a few miles, the propriety of bringing vessels of eight feet draught of water across, if practicable, would be readily admitted; but it may well be questioned, whether to save the expense of lading and unlading at each end of a canal three hundred miles long, the expense of cutting two yards deeper than would otherwise be necessary, ought to be encountered.

It has generally been assumed, and perhaps too lightly admitted, that canals should be made on a perfect level. This axiom would not be questioned, if the transportation each way were of equal burden, if the distance or the frequency of good feeding streams were such as easily and constantly to supply, without danger of excess,

the incessant waste of water by absorption, leakage, and evaporation, and if the waters to be connected were on the same level ; but in a case like the present, rational doubts may be entertained. The difference of level being upwards of five hundred feet, all the descent which can prudently be obtained by an inclined plane, is so much saved in the expense of lockage ; and in all human probability, the transportation for centuries to come, will be of so much greater burden from the interior country than back from the sea, that a current from the lake is more to be desired than avoided, more especially as it will, in some degree, counteract the effect of frost. That inexhaustible stream of limpid water which flows out of Lake Erie, with little variation of height to endanger the canal, is a strong temptation to use it exclusively, until auxiliary supplies can be drawn from other reservoirs equally pure. Nor is it improper in this case to remark, that it is impossible there should ever be a considerable variation in the surface of Niagara River, at the mouth of Tonewanto. No supposable fall of rain or melting of snow, even if both were to take place at the same time, in the country which surrounds the great lakes, could raise, in any considerable degree, their extended surface. Indeed, we know from experience, that a greater difference of elevation at the mouth of Lake Erie, is occasioned by a change of wind, than by any variation of seasons. Admitting, however, a consi-

derable rise of water, no matter from what cause, at the source of Niagara river, it cannot suddenly, from the narrowness and shoalness of the channel, produce a correspondent rise at the foot of the Black Rock rapid ; and the elevation there must, in the nature of things, exceed that which is occasioned by it fifteen miles lower down ; especially as the river, including the two channels round Grand island, has, for the greater part of the way, nearly three times the breadth which it has above. If, however, it were only a deep bay, the water pressed forward by the wind, would be piled up to a considerable height ; but, instead of that, the river here, with a breadth fully double to what it has at Black Rock, precipitates itself over the first ledge, in its headlong course to the cataract, so that an increase of height is instantly counteracted by the increased rapidity with which it rolls over the rock.

In all events, it would be advisable to use this water exclusively for a great part of the way, even if the country afforded other resources ; and to this effect there must be some descent in the canal.

What the precise amount of that descent should be in every mile, the commissioners presume not to say. They do not pretend to sufficient knowledge on the subject, and with all proper deference, they refer it to a practical engineer.

Nevertheless, like other men possessed of common discernment, they perceive not only that the

quantity of water which runs in a given time, must be proportionate to the rapidity with which, and the aperture through which it passes, but also that the rapidity itself will depend, not merely on the declivity, but also on the mass, because, in a deep and wide channel, the friction must be less than in one that is narrow and shoal. It will depend also on another circumstance, whose effect, that single cause remaining the same, will vary according to such of the preceding circumstances as may be connected with it.

Admitting, for instance, a stream to be deep and wide in descending an inclined plane, its velocity will be accelerated. But if the inclination be not great, and the channel shoal and narrow, the friction may so counteract the descent as to retard the velocity. From these considerations it is evident, that the sum of descent must depend primarily on the quantity of water required. This in navigation ascending and descending by locks, must be greater than when carried along a plane. It must also be greater in a loose than in a stiff soil. Moreover, the quantum of descent required, must, after the needful supply of water is ascertained, depend on the length, the width, the depth, and finally on the course of the canal, whether direct or serpentine. And here the same common sense presents another important consideration. The amount of rapidity which may with safety be hazarded, will depend on the texture of the substance through which the current passes. No na-

vigable velocity can injure a rock of granite, but a gentle current will sweep off the substance of bog meadow. In like manner, banks which resist when the course is direct, may be eaten away, and the current itself be retarded, if propelled along a tortuous course. The commissioners cannot, therefore, too often repeat, that their report must be accepted as suggestions proceeding from a superficial view, and not as conclusions founded on sufficient and scientific investigation. After this preliminary caution, they assume hypothetically, that a canal were run in such manner as that the average descent were six inches in every mile. Whence, taking the surface of Lake Erie as the standard level, they have in gross the following results.

From Lake Erie to	Miles.	Descent.	Total descent.	Actual descent.
The mouth of Tanewanto	10	5	5 feet	5
" Genesee river, about	68	34	39	65
" Seneca Lake - - -	46	23	62	145
" Cayuga Lake - - -	6	3	65	195
" Rome Summit - - -	66	33	98	145
" Little falls of Mohawk	38	19	117	$\left\{ \begin{array}{l} 203\frac{1}{2} \\ 245\frac{1}{2} \end{array} \right.$
" Schoharie - - -	38	19	136	
" Height of land between Schenectady and Albany	24	12	148	220
" Hudson River				
	14	7	155	525
	310			

Casting an eye on the Map it will be seen that the first difficulty in the above course will be to cross the Genesee, at an elevation of twenty-six feet above its surface. But unless the Canal be lowered down to that river, the expense of an aqueduct cannot be avoided, because from the upper falls, which are too high, there is little descent to the lower falls; and if, from any cause, it be advisable to cross it by an aqueduct, the addition of a few feet in the height will not much increase the expense. Indeed, considering the swell of the river in freshes, an elevation short of twenty feet would scarcely leave sufficient space under the arch. The next difficulty will be, in crossing the mouth of Seneca Lake by an aqueduct eighty three feet high; but this also, if a convenient place can be found, will not be important, because a moderate aperture will suffice to void the equable stream from that Lake.

The third difficulty is at the mouth of Cayuga, where the elevation is one hundred and thirty feet. Even this might be encountered without any unusual hardihood, if the hills approached each other, but the valley to be crossed is not much, if any thing, short of a mile; and to erect a mound of that length, and of the sufficient height and breadth, is an herculean labour. Whether it will be performed, must depend on the arm that undertakes this task, respecting which a few words may find their proper place hereafter. Supposing, however, that difficulty to be surmounted, it is

believed that none will remain, which cannot be in a considerable degree avoided, by bending occasionally to the southward, and returning round the northern points of the hills, till the canal is brought opposite to Rome. Its elevation there above the Mohawk, will be forty-seven feet, or less, by one foot for every two miles that it may be lengthened. The general face of the country here, leaves no room to doubt that convenient ground can be discovered south of Rome, at an elevation of forty feet above the Mohawk. How far it may be practicable between that place and the hills east of the Schoharie, must be decided by actual survey. The elevation, if not in other respects injurious, will be useful in passes that might otherwise necessitate a descent to the Mohawk. Thus at the Little Falls of that river, the canal, at an elevation of eighty feet above its upper surface, may, it is believed, be brought through or round the hill, at no enormous expense. The still greater elevation of one hundred and fifty feet at the Schoharie, will permit of a considerable bend to find some narrow gorge, and finally, an elevation of seventy feet above the height of ground, between Schenectady and Albany, will enable the engineer to choose for the course of his canal, and the position of the locks, the most suitable soil and convenient situations. In a word, if, on due examination, a thing of this sort should be found practicable, instead of depriving the country of water, every drop of which is need-

ed by its inhabitants, they will gain a great addition from the canal; and as to the navigation singly considered, there can be no doubt but it must in that way be superior to a waving course, ascending and descending by locks; for not to mention the expense of constructing and keeping them in repair, the time spent, and tolls paid in passing them, must considerably enhance the freight of goods. But if there be no lockage, and the toll be no more than is needful to keep the canal in repair, it will amount to so little, as not to merit notice in a calculation of freight. Rejecting it therefore, and allowing two horses and three men to take a boat of fifty tons burden twenty miles a day, which is certainly within bounds, and putting the whole expense at five dollars on the lading downward, leaving the return load as profit, or, which is equivalent to reducing the distance one half, we have fifty tons transported ten miles for five dollars, being one cent per ton, per mile; to speak then in round numbers, it will cost three dollars to bring a ton from Lake Erie to Hudson's river, being little more than one half of what is now paid for freight on Lake Ontario, between Oswego and Lewistown. Without entering into calculations, which every person can easily make for himself, to enumerate the bulky articles which will derive value from such facility of transportation, it may be proper in this place to recur again to the commercial competition with our British neighbours.

A tolerable good navigation up and down the St. Lawrence already exists, but the cheapest rate at which transportation has been performed within the last ten years between Kingston and Montreal, according to the best information the Commissioners have been able to obtain, is one dollar per hundred ascending and half as much descending the river. But admitting the freight could be so reduced as to be on a level with that between Albany and New-York, admitting also that the transportation across Lake Ontario could be performed as cheaply as through the proposed canal, and even admitting that the risk on that Lake, and of course the premium of insurance, were nothing, still it would follow, that transportation from the head of Lake Ontario to Montreal, would cost as much as from the mouth of Tanewanto to New-York, leaving a preference to the latter to the cost of land carriage from Chippeway to Queenstown. Moreover, nature has given, other things being equal, a decided preference to the port of New-York. There are, generally speaking, six weeks of navigation from Albany in the spring, before vessels can safely leave Montreal to descend the river St. Lawrence, and as many more in the autumn after the mouth of that river is closed. The navigation from New York is seldom obstructed, so that produce deposited there, can be sent to market during five months in which at Montreal it lies a dead weight on the hands of the owner. This circumstance is of especial im-

portance in regard to wheat and flour, which can be sent from New-York, so as to be sold in the south of Europe, before those articles can be brought from the Baltic, or gathered in the country. Whereas if shipped from Montreal in the month of May, they cannot reach Spain or Portugal until after supplies are received from Dantzic, and but a short time before the harvest, which is early in July.

Thus it is evident, that the canal will, if properly effected, turn to the United States the commerce of the upper Lakes. Moreover, a side cut of five or six miles, would, by means of locks, connect it with Lake Ontario in the harbour of the Genesee; and in like manner, a connection would be established with the Seneca and Cayuga Lakes, from the heads of which, the short portage by good roads to Newtown and to Oswego, opens a communication through the Susquehannah to the Chesapeake. Nor is it improbable, that by running upon the west side of the Cayuga, means may be found to establish water communication with the Susquehannah, from the great bend of which, a good and short road may be made to the Delaware.

Thus a variety of markets may be opened, to stimulate and reward the industry of those who are now, or may be hereafter, settled along the Great Lakes, whose shores, exclusive of Lake Superior, are upwards of two thousand miles, surrounded at a convenient distance by more than fifty million acres of land.

To the question, what will the proposed Canal cost, it is not possible to answer with any thing like precision. Indeed preliminary points are to be adjusted, and of these the first is, whether it is to be made for sloops or barges. The expense of the former will, it is believed, be at least double that of the latter. Another question, whether it is to be carried along an inclined plane, or by a line ascending and descending, must be decided by a comparison of the expense, and of the utility each way. In general, however, it may be satisfactory to the Honourable the Senate and Assembly, to receive the information, which the Commissioners feel no hesitation in giving, that as far as they have been able to extend their inquiry, there is no part of the civilized world, in which an object of such great magnitude can be compassed at so small an expense. Generally speaking, the course is through a tract of country, the excavation whereof will be easy, and there is at convenient distances from the spots where it may be wanted, a sufficiency of freestone as well as of limestone, with a superabundance of fuel. The subsistence of men also, and of cattle, will be abundant and cheap. The wages of the former are, as is well known high, but measures may certainly be devised, to obtain the labour for so great a public work, more cheaply, than is practicable in private operations, on a small scale. But the Commissioners beg leave to observe, that no supposable expense can bear an undue proportion

to the value of the work. Thus were it, by giving loose to fancy, extended to fifty millions of dollars, even that enormous sum, does not exceed half the value, of what, in all human probability, and at no distant period, will annually be carried along the Canal.

The more proper question perhaps is, in what time can it be effected? for if an annual sum be appropriated, and secured on a solid fund, it will be effected in time, and the greater the sum the shorter will be the period. The Commissioners have no doubt, but that good bargains for the public, may be made with those through whose land the Canal shall pass, and they have great pleasure in stating, that generous offers have already been made by many proprietors, the acceptance of which must necessarily be deferred to the moment, when the business assuming a more substantial form, shall be committed to superintendants duly authorized to treat. Enough has been said to show that no accurate estimate of the expense can as yet be made. To give some general notion, however, it may be assumed, that in common cases labourers ought to dig and remove to a reasonable distance, eight cubic yards per day. The excavation may therefore be set at the eighth of a dollar per cubic yard, an average breadth of fifteen yards, and depth of one yard, which by means of the mound on each side will be sufficient for four and a half to five feet of water, giving for each yard in length fifteen cubic

yards, may therefore be taken at two dollars, and the mile at three thousand five hundred and twenty dollars, but allowing for the obstructions of trees and roots, not less than four thousand dollars. This gives for three hundred miles, one million two hundred thousand dollars. The excavation needful, to bring a column of water fifteen yards wide, and two yards deep, with sufficient descent from the Tanewanto, through the middle steep, will, at the same rate, cost two hundred and fifty thousand dollars. Thus, to speak in round numbers, the Canal alone, might cost a million and a half, drawn through a favourable soil, lying conveniently, without the opposition of rocks or other impediments. Many of these, however must be expected, and will perhaps double that sum. Another great expense is that of locks and aqueducts. It is said that the former will cost at the rate of one thousand dollars per foot of ascent for a vessel of fifty tons ; this is believed to be a low estimate. At any rate, in a Canal like the present, there must be a double set, one for the ascending and one for the descending navigation. Even then it is to be feared that there will be much embarrassment and delay. Thus the lockage being taken at two thousand dollars per foot, for three hundred and forty feet of descent and ascent between lake Erie and Rome, will cost six hundred and eighty thousand dollars, should that waving course be deemed adviseable. From Rome to Hudson's River, a descent of three hun-

dred and eighty feet, will call for an addition of seven hundred and sixty thousand dollars. If then the locks be put at a million and a half, it is the lowest rate which can prudently be supposed. It would, indeed, be safer to set them at two millions. There will still remain for aqueducts, embankments and mounds, a considerable expenditure, which cannot at present be ascertained. To estimate the expense of aqueducts, it may be advisable to put the cubic yard of masonry at two dollars, and consider the aqueduct as a solid mass. It is true, that not more, perhaps, than one-third of the materials required for a solid mass will be used, but the workmanship on those materials will be much more costly; many of the stones must be hewn, and many clamped together with iron; moreover, the expense when such buildings are raised to a great height, is proportionately greater than when nearer the earth. An aqueduct over the Genesee may, perhaps, be one hundred and fifty yards long; but to avoid mistakes, it will be more adviseable to suppose two hundred. The height above mentioned is twenty-six feet; but as well to obviate mistakes, as for convenience of calculation, it may be taken at ten yards, and in order to preserve the full breadth of the canal, the aqueduct may be considered as twenty yards wide. Thus we have a result of forty thousand cubic yards of masonry, which, at two dollars, will require an expenditure of eighty thousand dollars. A remark which will not escape the

most cursory observer, is, that a single set of locks, to ascend and descend five and twenty feet, will cost fifty thousand dollars, at the lowest estimation; and on the system of level canals, the descent in this case is sixty five feet. Excepting the Genesee, no considerable aqueduct will be needful, because the streams from the lakes being equable, small arches may be turned over them, and the canal be carried along a mound of earth. The expense of such mound must depend on the convenience of obtaining materials. Where hills of sufficient elevation in the neighborhood, give the advantage of running along wooden rail ways, or where the transportation may be by boats along the canal itself, a mound will cost but little, compared to that which is raised solely by the labour of men and cattle. All estimates, therefore, which are not founded on exact local knowledge, must be vague and uncertain. Assuming, however, as a basis, the price of one dollar for eight cubic yards; to estimate the expense of a mound over the Cayuga Lake, one hundred and thirty feet high, and sixty feet wide on the top, with an inclination of five and forty degrees in the descent of the side, we have at the base, one hundred and ninety feet, giving a mean width of one hundred and twenty-five, which, multiplied by the height, one hundred and thirty, is sixteen thousand two hundred and fifty feet, or in round numbers, one thousand eight hundred square yards. These, at the eighth of a dollar each, will cost for every cu-

bic yard of the mound in length, two hundred and twenty five dollars. Allowing, therefore, two thousand yards instead of a mile, so as to compensate for the expense of an arch two hundred feet long, with a span of fifty feet over the stream, and for other contingencies, the whole cost might be four hundred and fifty thousand dollars, perhaps half a million.

Under the impression resulting from these observations, it is believed, that one million of dollars would provide for every thing of this sort, so as to bring the canal to a reservoir near Hudson's river, without locks, for four million of dollars. A descent there, of from three to four hundred feet by locks, would cost, perhaps, another million ; or if it should be deemed more advisable to transport by rail ways, the water used for machinery, would probably yield a rent sufficient to keep the canal in repair.

But hitherto, this navigation has been contemplated no further than to the mouth of Tonawanto, in Niagara river ; from thence to Lake Erie is ten miles, and the last mile, at the Black Rock rapid, is said to have, through part of a fall, which is, on the whole, four feet, a rapidity of near seven miles an hour ; so that vessels descending below it, may wait a whole season, for wind sufficiently favourable and strong, to get up. This obstacle, though great, does not appear insurmountable. Perhaps two wharves, similar to those which surround our cities, made impervious to the water, and sunk parallel to each

other, during the distance of one mile, with two pair of gates similar to those of dry docks, placed so as that the upper one being shut, there shall be still water from below, and that the lower one shut, will make still water above, may fully answer the end. The cost, where wood and stone are so abundant, cannot be great; and as wood is not liable to rot under water, nor exposed in fresh water to the ravages of worms, the work may be sufficiently durable. On the whole, it is conceived, that the expense of this national work may be five millions of dollars; a sum which does not, it is presumed, exceed five per cent. of the value of the commodities, which, in less than a century, it will annually transport, should it be now commenced, so as duly to encourage population around the upper lakes.

The Commissioners hope they shall be excused, if, in this place, they advert to a question more important, perhaps, than any other. By whom shall the needful expense be supported? They take the liberty of entering their feeble protest against a grant to private persons or companies. Too great a national interest is at stake. It must not become the subject of a job, or a fund for speculation. Among many other objections, there is one insuperable: that it would defeat the contemplated cheapness of transportation. It should always, on occasions of this sort, be recollected, that the reasons adduced for grants to individuals in Europe, apply inversely here. Few of our fel-

low citizens have more money than they want ; and of the many who want, few find facility in obtaining it. But the public can readily, at a fair interest, command any reasonable sum. Moreover, such large expenditures can be more economically made under public authority, than by the care and vigilance of any company.

It remains, therefore, to determine, whether the canal should be at the cost of this state, or of the union. If the state were not bound by the federal band, with her sister states, she might fairly ask compensation from those who own the soil along the great lakes, for the permission to cut this canal at their expense. Or her statesmen might deem it still more advisable, to make the canal at her own expense, and take for the use of it a transit duty, raising or lowering the impost as circumstances might direct, for her own advantage. This might be the better course, if the state stood alone. But fortunately for the peace and happiness of all, this is not the case. We are connected by a bond, which, if the prayers of good men are favourably heard, will be indissoluble. It becomes proper, therefore, to resort for the solution of the present question to principles of distributive justice. That which presents itself is the trite adage, that those who participate in the benefit should contribute to the expense.

The Commissioners presume not to go one step further. The offers of individuals already alluded to, shew their conviction of that equity by

which the state is called on for her share. The wisdom as well as justice of the national Legislature, will, no doubt, lead to the exercise on their part, of prudent munificence ; but the proportion, the conditions, the compact, in short, must be the result of treaty. Whether the honorable Senate and Assembly will take steps towards a negotiation, and what these steps may be, it is in their wisdom to determine.

All which is humbly submitted,

**GOVERNEUR MORRIS,
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